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ABSTRACT

This paper describes three government-funded technology programs in Portugal and the changes they brought about in Portuguese schools: (1) Project MINERVA (Computing Means in Education: Rationalization, Valorization, Actualization), launched in 1985 and ended in 1994, was an innovative program to introduce new technologies in schools; (2) Program Internet in School, launched in the 1997-98 academic year, aims to connect all private and state schools to the Internet; and (3) Program Nonio-21st Century, created in 1996, has the priority of developing modern, updated schools that strive for precision, quality, and autonomy. In concluding remarks, the paper notes that the Portuguese government, through the Secretary of Science and Technology, announced the intention of distributing one million free e-mail addresses and of increasing one thousand-fold the production of Portuguese sites on the Internet with the contribution of different partnerships. Also discussed are the Internet as a vehicle for the transmission of American culture and the positive and negative effects of globalization. (AEF)

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New Information and Communication Technologies in Portuguese Schools: Paving the Way for the Next Millennium

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In 1985, over five hundred years after having set sail towards 'unknown new worlds', Portugal ventured towards an 'amazing new world' when it launched Project MINERVA, an innovative Government-funded program to introduce new technologies in schools. Two other Government programs followed and are currently under way - Program Internet in School (Programa Internet na Escola) and Program Nónio-21st Century (Programa Nónio-Século XXI). I will be talking briefly about each one and the significant changes they brought about in Portuguese schools.

Portugal is a small country located on the southwestern-most tip of Europe, "a garden planted by the seaside", as we affectionately refer to it. Up until the mid-seventies it was considered not only a somewhat backward country, but also a very closed society when compared to Europe and the rest of the Western world. That image has changed radically in the last two decades. Today Portugal is a modern country, extremely proud of having hosted Expo '98, the last World's Exposition of the millennium, and having done a very good job at it, I proudly admit, overturning the wildest skepticism. This important modern happening in Portuguese history, which celebrated a major event both in Portuguese and in World history and culture - the discovery of the sea route to India by Vasco da Gama -, contributed to the change in our own image as a country, strengthened our national identity and boosted our national pride.

At a time when most of the world is being confronted by 'globalization' at different levels and in different fields, defending a cultural and historical heritage as well as preserving and stimulating a national identity should be a national priority. How can this be achieved? Through Education. An Education that will 'open itself up' to the World and give access to what is happening everywhere in the information society we are immersed in. Above all, an Education that will give special emphasis to what is happening in each country, as well as to what happened in the past and what is expected to happen in the future. An Education that should avoid the intrusion and establishment of a 'global' identity. What more innovative, effective and appealing way of doing this, for students, than to resort to the largest repository of information and 'human' resources available at our fingertips - the Internet?

The emergence of the information society has undoubtedly posed new and pressing demands for Education in general and for schools in particular, especially for the need to come out of their shell and 'open' themselves up to the World in order to strive for the permanently 'informed school' of the future. As we all know, the learning process is no longer a monopoly of schools. On the contrary, learning takes place less and less in school and more and more outside its four walls, in the real world. Thus, the school's priority is to create means to attract students ever more distant from this closed circuit and to keep them attracted for the duration of their stay. But it is also the task of the school to give these students the tools and the stimulus they will need to commit themselves to lifelong learning. Nowadays, change takes place at such speed that constant update is a 'must'. How can the educational system achieve this? By using 'real' resources. Resources which are a part of the everyday world students belong to. Resources which will be a part of their working life. Resources which will put them in contact with real situations and real problems, in short, with the real world!

But for the school to survive as a learning institution, it needs to modernize itself, to keep up with developments 'outside' its four walls, and to produce integrated citizens, citizens prepared and ready to face the challenges that lie ahead, academically and professionally speaking. The task of modernizing Portuguese schools saw its beginnings back in the mid-eighties. However, it has been a slow and gradual process, as is everything in Education.

Project MINERVA, an acronym which stands for Computing Means in Education: Rationalization, Valorization, Actualization, was launched in 1985 on an experimental basis, at a time when similar projects were starting out in other European countries, here in the US, and a bit all over the world.

We owe this pioneering idea to Professor António Dias de Figueiredo, a well-known computer engineer from the University of Coimbra, a man of great vision as well a man of action[1]. His idea was to introduce new technologies in 1st-12th grade Portuguese schools and to stimulate the production of educational software. How? By supplying schools with the necessary equipment, by guaranteeing the backup of the higher education institutions, the backbone of this process, and by giving basic training in the new technologies to the teachers who would be working with them.

The boom in microcomputing and the interest on the part of universities in developing research about the use of computers as educational tools brought about this idea. The resulting interaction between the schools and the universities, an extremely innovative feature of the program, highly stimulated the research.

Initially, Project MINERVA had two basic aims: teacher training in computers and the use of computers as a support for the teaching-learning process. As time went by, it gradually turned into a tool to motivate students and to promote interdisciplinary and project work, with more than half of the twenty-five Minerva Coordinating Centers investing in educational telematics by the 1989-90 school year.

From 1989 until its end in 1994, it was a truly national project developed by those Coordinating Centers spread throughout Portugal and aided by Minerva School Centers and Local Support Centers. Its preparation involved the development of software, curricular activities and training courses, as well as partnerships with local authorities and the business world. The foundations for an approach between the school and the community date from this project. It also stimulated international cooperation, namely with the European Pool for Educational Software (EPES) and with South American universities, a cooperation which continues to this day through the Iberian-American Network of Educational Computing (RIBIE - Rede Ibero-Americana de Informática na Educação).

MINERVA was financed by the Department of Education and coordinated by a national committee, which, apart from very specific functions, also promoted regular conferences, seminars, meetings and workshops to stimulate the exchange of knowledge, experiences and ideas on a national and international scale.

It was developed by appointed universities and schools of education working together with a network of schools of different levels. Teacher training was given by university and non-university teachers. In addition to the Coordinating Centers, ninety Local Support Centers emerged between 1989 and 1992 to help in training and guiding the teachers involved in the projects.

Schools had to apply in order to participate, and their projects were subject to approval based on aims, profile of the teachers involved, resources needed and proposed interactions between the school and the Coordinating Center. In 1992, a total of 1170 schools of all levels were involved, with 100,000 students taking part in classes and workshops at least once a week. Elementary schools had 1-2 computers, and middle and high schools 4-6. They were used not only for curricular work on a disciplinary and interdisciplinary basis, but also for extra-curricular work, such as computer clubs.

Word processing, spreadsheets, data bases and electronic publishing soon became the favorite software applications used as learning tools. Educational software was produced for practically every subject and then submitted to official national competitions. When approved, it was published and sold

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[1] I am honored to have had Professor Dias de Figueiredo discuss my Master's Dissertation. He turned what is normally a nerve--wracking event into a relaxed and extremely enriching hour-and-a-half exchange of ideas. I am indebted to him for that moment as well as for the extraordinary Preface to my book *NetLearning: The Internet in Education (NetAprendizagem: A Internet na Educação.* Porto: Porto Editora, 1998.).

by the Department of Education. There was also a licensing of foreign software and the appropriate adaptation to the Portuguese language and culture. An example of this is the Portuguese version of LOGO. Support materials for the introduction of new information and communication technologies in schools were also produced. No doubt, MINERVA was the launching pad for a new era in Portuguese schools and an extremely important step forward in the exchange of knowledge between peers.

Project IVA (Computing for Active Life), a subprogram of MINERVA developed between 1989 and 1992, gave 12th grade students basic training in computers, including operating systems, word processing, electronic publishing, spreadsheets, data bases, networks and email, and also introduced them to professional software. BBSs were introduced at the beginning of the nineties, so the students involved in this annual program exchanged experiences and information through email.

Project FORJA (In-service Teacher Training on Information and Communication Technology for Young People for use in Active Life), another MINERVA subprogram, resulted from the need for 'peer coaching' - teachers training teachers - a need still felt today. It was the first step in the development of an organized and systematic training structure, which is doing very well. In fact, the Training Centers of School Associations held their annual national conference in February and the basic conclusions were that these Competence and Training Centers have conquered their own 'space' and are doing 'quality' work.

Between 1994 and 1996 we experience what I would call 'a standby period', or a period of reflection. It was a time when experiences belonging to a recent past were being organized and new ideas were simmering or being cooked. To a certain extent, it was a period in which a continuation of MINERVA was being prepared, this time with a new and very significant addition - the Internet - a worldwide network paving its way into many school systems all over the world. The Portuguese school system could not stay behind. Thus, 1996 witnessed the launch of two major new technologies programs in Education. Both profited from the MINERVA experience. Both involve people who came from MINERVA. To a greater or lesser degree, both follow certain footsteps of MINERVA, a project which undoubtedly left a very strong imprint on the Portuguese educational system.

Program Internet in School, an initiative of the Department of Science and Technology, is part of a much wider government plan called National Initiative for the Information Society. It was officially set up in the second quarter of 1997 and launched in the schools in the 1997-98 academic year. It is an ambitious program initially aimed at the 5th-12th grades and some elementary schools, in a second phase at the rest of the elementary schools. Its objective is to connect each and every private and state school to the Internet. How? By installing a multimedia computer with a 64K ISDN connection to the Internet in all the school libraries or media labs, at no extra cost for the school, thus giving students and teachers free and quick access to the Net. Why the library or media lab? Because it is the place where all the information resources of a school are generally found. In its first year, all 5th-12th grade schools (a total of 1612) and 40 pilot elementary schools were connected, as well as 120 public and municipal libraries. This plan will be completed by the end of the current school year.

Access to the Internet is provided by the recently created Science Technology and Society Network (RCTS - Rede Ciência, Tecnologia e Sociedade)[2], which is coordinated by the Foundation for National Scientific Computing (FCCN - Fundação para a Computação Científica Nacional). Once again we have a network linked to universities and state research labs, supporting 1st-12th grade schools. It is gradually being extended to local and municipal libraries, museums, document centers, archives, and non-profit organizations, thus providing a close cooperation between the academic, scientific and cultural communities. To ensure access of the schools to this network, fourteen PoPs (Points of Presence),

[2] It's an extension of the National Scientific and Research Network (Rede da Comunidade Científica Nacional - RCCN), which is a part of the Internet.

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were set up in universities spread from the North to the South. Technical support for the equipment, a major aspect of all these processes, is given by technicians working at these PoPs, who provide a 'helpdesk' service. Initially, when the computers were installed, each school appointed two teachers, and in some schools also two students, who were given basic technical training (2-5 hours) on how to run the equipment.

At the same time that the program was set up, the Department of Science and Technology created uARTE (unidade de Apoio à Rede Telemática Educativa), the Educational Telematics Network Support Unit of the program, which is the linking element between the schools and the different partners - Scientific, Educational and Professional Associations, Teacher Training Centers and the Department of Education. This Unit not only supports Program Internet in School, but also promotes and launches activities to develop the use of the Internet in the school, and produces support materials for students and teachers. Its own Web server allows uARTE to maintain an excellent site, which I strongly advise you to visit at http://www.uarte.mct.pt, to supply schools with their own email address and site, and to develop initiatives through email, videoconferencing and chat.

Program Internet in School supports the idea that each school be connected on a continuous basis during working hours so that students and teachers can access and explore the Net for educational objectives. There are those who argue that **one computer** is not enough or it's as good as nothing. I don't agree. I favor the idea of 'starting small' and growing according to individual needs and possibilities. Therefore, I truly believe that this one multimedia computer was a very significant beginning of a never-ending process, a process which is growing in popularity every day, every week and every month, comparably more among the students than the teachers.

The Program has been a great success due to the enthusiasm and motivation of the student population. Thus, the multimedia computer initially set up in the school library and expected to stay there, has, in many schools including my own, been moved to an add-on room next to the library where this computer, and others acquired when possible, or given to the school, are permanently at the service of the students and teachers.

Connecting schools to the Internet has several aims in mind, among them:

- to make students (and teachers) aware of the 'potential' of the Net - and once they get the feel of it, there's no stopping them;
- to 'open' schools to the outside world and to keep them in touch with reality;
- to give access to a never-ending source of 'information', which makes the Internet the largest ever library or 'information storage house' in the world;
- to stimulate 'communication' among people, thus opening up different possibilities for the teaching-learning process.

But what is the use of having the resources if no one knows how to use them or wants to use them? What is the use of having a connection to the Net if no one knows how to turn on a computer much less get connected to the Net and start surfing, or send and receive email? Or if no one knows how to integrate these resources into their classes? How can we get people to start using this network full of resources effectively? Through training. 'Training' teachers in the use of these new technologies is a 'must' if we want to start advancing towards the school of the next millennium, which takes us to our last program.

Teacher training has been the basic aim of **Program Nónio-21st Century**, a Program of Information and Communication Technologies in Education created in October 1996 by the Department of Education. Nónio (the nonius) is a measuring instrument of great precision invented by Pedro Nunes

(1502-78)[3], a Portuguese mathematician, cosmographer, geographer and pedagogue of the sixteenth century, which represents accuracy and a better understanding of the world around us. Isn't that what the new information and communication technologies strive for today? Thus the name given to this program currently under way in Portuguese schools, whose target group is, once more, elementary, junior high and high schools, once again backed up by the higher education community.

Nónio recovers the experience gained from MINERVA and continues some of its objectives while developing others, such as: (1) a close cooperation with the Department of Science and Technology, (2) teacher training with the support of a more advanced structure, (3) production of educational software, (4) development of the networking effect in schools, and (5) development of international cooperation. Examples of these are the European Network of Innovative Schools (ENIS), the European Schoolnet (EUN) and the annual Netd@ys initiatives.

Developing modern, updated schools that strive for precision, quality and autonomy is the priority, because Education must commit itself to 'quality and excellence'. Equity and universal access cannot compromise with low standards. What better example than Pedro Nunes and his pioneering work to encourage and stimulate the building of the society of the future? What better tribute to this great Portuguese?

In order for schools to equip themselves and integrate the new technologies into the learning process, they must submit projects to the Department of Education. Once approved, Nónio allocates funds which permit the schools to start acquiring equipment according to their specific needs and thus develop their work. Projects are both disciplinary and interdisciplinary, involving all areas of learning[4]. However, it is interesting to refer that the 'environment' has been a favorite theme.

The main objective of this program is the generalized use of new information and communication technologies in the educational system in order to improve the conditions in which schools function, make the teaching-learning process a success, strive for the modernization and quality of the educational system, and expand the national market of educational software. In doing so, it will hopefully contribute to the development of a more reflective and engaged information society.

As I referred above, Nónio is also dedicated to providing teacher training in order to stimulate the use of the growing resources. This training is guaranteed by Training Centers coordinated by Competence Centers. It backs up projects through the guidance of staff from the Competence Centers. It stimulates and supports the production of educational software. It promotes national and international educational exchanges of information through networks. And it gives financial aid to participants in conferences, seminars and workshops of a scientific and pedagogical nature. Recently, it also created a free email account service for 1st-12th grade teachers, student associations and parent associations.

Program Nónio has a duration of four school years and is submitted to an annual assessment, which permits timely corrections. There will be a final evaluation, as happened with MINERVA.

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[3] In the inventor's own words, "an instrument well suited to observation of the heavenly bodies, with which one can accurately determine their altitudes". (Reis, António Estácio dos. *Medir Estrelas* [*Measuring Stars*]. Lisboa: CTT Correios de Portugal, 1997.)

[4] My school (Escola de Sto. António EB 2,3 - Parede) is implementing a three-year project in the areas of Math, English and French, Educational Technology, Music and Photography, for which it was contemplated with a sum of $42,000, granted in parts over the three years. 'Rede Mattic' (available at http://www.malhatlantica.pt/mat/), the Math project currently under way in my school and in seven other schools in the area, was recently awarded the first prize of the Department of Education.

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Both Programs, Internet in School and Nónio-21st Century, complement each other and are undoubtedly paving the way for the society of the next millennium.

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It is now appropriate to ask 'What makes a Portuguese teacher want to get involved and become a part of this 'brave new world'?' Certainly, much the same as teachers anywhere else: the need to motivate students and fulfill their needs and aspirations, the need for self-fulfillment, the desire to be up-to--date, but above all, a great deal of devotion and passion. Sadly though, we are still a small minority, because while very few colleagues care about what we are doing, others consider that the student population we have does not deserve the extra work these new technologies involve. Nevertheless, I feel that this *status quo* is gradually beginning to change, if not for personal motivation or for a need to do something different, at least because students are starting to ask for it. I truly believe students will be an extremely important agent or vehicle of change. Most probably, though, agents of an 'enforced' change, because they will ultimately 'demand' it! It is interesting and symptomatic of what I hope will become a trend that several of my 6th grade students now frequently ask if they can do their homework or project in the computer.

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How does all this relate to American culture and to the transmission of American culture? Is the Internet a powerful vehicle of transmission of American culture? Are we all being subjected to an 'Americanization' process similar to that imposed on the multitudes of European immigrants at the beginning of this century?

First of all, the United States *was* the birthplace of the Internet, therefore, it is only natural to have an advantage over other countries, since it was here that the pioneering ideas emerged (and many still do!), initially for military reasons, then for academic reasons, and later on for business reasons. Second, the English language is a universal language, which undoubtedly poses an enormous advantage. Third, the pioneering spirit of Americans, their openness and their love for adventure highly contributes to attracting more people, more rapidly to new enterprises. So, is it any surprise that when we connect to the Net most of the sites we find, or are taken to, are American?

But in spite of these advantages, I do believe there is also a more or less conscious desire to drag others along to '*the American way*', to the American culture, which inherently is characterized by a desire for dominance. Is it natural? Is it admissible? That discussion is not in the scope of this paper. However, what is not natural or admissible is for other cultures to criticize this perspective, but practically sit still, arms crossed, waiting for some sort of magical change. We don't need words, we need action! If a people, a government, whatever, aren't happy about the *status quo*, they need to do something about it. They need to act! They need to get to work, fast! Consequently, they need to stimulate their cultural, academic and scientific communities to produce their own work. They need to defend their heritage and to make it known to others!!!

Think of the Portuguese community worldwide, basically spread throughout Europe, Africa and South America. According to my estimate, we are approximately 220 million. If we all worked for the same objective, that is, if we all cooperated towards giving the Portuguese language and our common heritage the place it deserves in the Internet, think of how much we could achieve. Because the fact is that despite the boom in Portuguese sites in this last year or so, particularly those produced by schools, thanks to the two programs I described, they are still very few, especially for educational purposes. Therefore, when we want our students to do research, there is a certain language barrier. Although they all learn English at school, not many master it well enough to read and interpret most

documents in English. Thus, and whatever the reason, it is imperative that we develop our sites, and publish our own work and findings.

At the moment I am writing, I am pleased to say that the Portuguese Government, through the Secretary of Science and Technology, Professor José Mariano Gago, a genuine believer in the potential of these information and communication technologies in Education, and the member of who has done most to push this cause forward, announced the intention of distributing one million free email addresses and of increasing a thousand-fold the production of Portuguese sites on the Net with the contribution of different partnerships. The idea is to attract the general public to these new media and hopefully to stimulate a generalized use of the Internet[5] and the production of pages on a national scale. Although no details were given as to the how or when of the process, it *is* very encouraging news.

On the whole, I consider that the introduction of new technologies in Portuguese schools results from a worldwide process with roots in the US, and in recent years more so from the global spreading power of the Internet, a phenomenon with unprecedented effects in the history of Mankind. Therefore, it is closely related to the 'globalization' of the information and communication technologies as a result of the ubiquitous presence of 'the mother of all networks'.

Globalization has its good and bad side, as do most things in life. I have dealt with some of its positive aspects in terms of Education, namely, the widening of horizons and a closer contact among cultures, which will hopefully bring about a better understanding among Mankind. However, I cannot neglect the fact that it also represents homogeneity, uniformity and a certain (to be optimistic!) loss of national identity. And in that sense, it does pose a big threat, because it implies that in the future we may all be thinking, acting and doing the same things, living in the same way, apart from each other, only connected by machines, which immediately brings to my mind "The Machine Stops" by E. M. Forster, a short story which describes a future world I wouldn't like my children to inhabit, a world in which the key word is **sameness**. Consequently, and ultimately, globalization means replacing national identities by a 'global identity'.

Though I feel that we are more immersed in globalization each day that goes by, I don't know how to avoid its negative effects. But I *do* know that I am extremely proud of my roots and I strongly defend that preserving those roots on an individual and national basis is a **must**. Who knows, it may be a significant step in resisting the engulfing power of this aspect of globalization!

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[5] A recent survey reveals that one-third of the Portuguese homes have a computer, 18,6% of the population has access to the Net, but only 9,6% are regular users. (Barata, Clara. "Um terço com computador em casa." *Público* 15 Fev. 1999: 4.)

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